

1063-10

**Modification of the Atrial Substrate by Left Atrial Linear Lesions in Symptomatic Patients After Pulmonary Vein Isolation**

Sabine Ernst, Feifan Ouyang, Thomas Vogtmann, Matthias Antz, Karl-Heinz Kuck, St. Georg General Hospital, Hamburg, Germany

Trigger elimination by pulmonary vein (PV) isolation has been demonstrated to cure atrial fibrillation (AF). Despite initially successful PV isolation, AF can recur during follow-up.

**Methods:**

Of a total of 249 pts (mean age  $56 \pm 10$  yrs) that underwent PV isolation resulting in acute elimination of the PV spike potential (max. 30 W, 50° C over max 180 sec), a subgroup of 12 pts (10 m, mean age  $56 \pm 13$  years) underwent an ablation procedure aiming at a compartmentalization of the left atrium to treat their unchanged arrhythmia (3 intermittent AF, 9 chronic AF). Despite a mean number of  $2.3 \pm 0.9$  acutely successful PV isolation procedures, PV spike potentials were demonstrated in 7/12 pts at the beginning of the linear ablation session. Two linear lesions in the left atrium were deployed: one connecting the superior right to the superior left PV ("roof" line) and a second from the middle of the roof line to the anterior aspect of the mitral annulus. Mapping and ablation were performed using the CARTO system (irrigated tip 11/12 pts) during SR or pacing.

**Results:**

A mean number of  $42.3 \pm 15.7$  RF applications were used to deploy the two lines. Procedure duration amounted to a mean of  $465 \pm 111$  min and  $27.1 \pm 9.4$  min of fluoroscopy. Validation of line completeness was performed using conventional stimulation the CARTO system.

During follow-up (mean 154 d), all pts (8/12 pts) with complete lines were in SR, whereas in the group with persistent gaps 3/4 pts experienced recurrence of AF or AT.

**Conclusion:** Relapse of the AF after demonstrated complete PV isolation might be caused by re-conduction of the previously interrupted conducting fibres into the PV. However, even after repeat "successful" pulmonary vein isolation, AF does recur in a subset of patients. Additional modification of the left atrial substrate by long linear lesions resulted in SR when lines were completely deployed.

1063-11

**Correlation of the Pathology and Physiology in Circumferential Pulmonary Vein Isolation**

Wilber W. Su, Luiz Leite, Susan B. Johnson, Douglas L. Packer, Mayo Clinic, Rochester, MN

**Background:** Pulmonary Vein Isolation for AF cure has had limited success. The impact of any discontinuity within a circumferential lesion on chronic block is unclear. **Methods:** To assess the correlation between the pathology and physiology of chronic PV isolation, 38 PVs were ablated in 18 dogs. Circumferential ablation using a laser-energy balloon catheter was performed. End-point of energy delivery was bi-directional block or an ablation time of 600 seconds. Chronic block was reassessed at the end of a 4 or 6 months survival period. Post-mortem gross and histological specimens were performed to categorize the circumferential PV lesions and discontinuities in terms of 12 clock-face sectors. **Results:** Of the 38 PVs ablated, chronic block was confirmed in 9/38 PVs (24%), of which 6/9 PVs had 100% circumferential lesions. In 3/9 PVs, chronic block was present in the LSPV despite an inferior gap of < 8% of circumference. 15/38 PVs had initial acute block but no chronic block (transient block), of which 8/15 RSPVs and 7/15 LSPVs had gaps inferiorly. Block was never achieved in the remaining 14/38 PVs, of which all had inferior gaps in 3 RSPVs, 6 LSPVs, and 5 LIPVs.

**Conclusions:** Excellent correlation exists between the physiology and pathology of chronic PV isolation. Nevertheless, small gaps do not preclude successful disconnection, although most discontinuities greater than 8% will prevent long-term block in the canine heart. Increased gap size correlates with a reduced likelihood of achieving long-term PV isolations.

Physiologic outcome vs. Presence of Gap

	Chronic Block	Transient Block	No Block
<b>PVs (%)</b>	9 (24%)	15 (39%)	14 (37%)
<b>PV without gap</b>	6 (5 RSPV, 1 LSPV)	None	None
<b>PV with gap (% of circ.)</b>	3 (< 8%)	15 (31±25%)	14 (39±23%)

1063-12

**Is Inducibility of Atrial Fibrillation With Burst Pacing a Marker for Atrial Remodeling and Poor Outcome After Successful Pulmonary Vein Isolation?**

Joseph W. Poku, John F. Beshai, David Lin, Sanjay Dixit, Laurent Lewkowicz, Edward P. Gerstenfeld, David J. Callans, Yadavendra Rajawat, Francis E. Marchlinski, University of Pennsylvania, Philadelphia, PA

**Background:** The ease of inducibility of atrial fibrillation (AF) after pulmonary vein isolation may be a marker of atrial remodeling as indexed by the extent of atrial disease and duration of AF. It may also serve as marker of procedural success after PV isolation. We sought to evaluate the frequency of PAF inducibility and to study its association with anatomic/clinical characteristics and AF recurrence in an unselected group of patients undergoing PV isolation.

**Methods:** Forty seven patients (mean age  $49 \pm 16$ ; 41 males and 6 females) with drug refractory PAF undergoing PV isolation were enrolled. After successful PV isolation, rapid atrial pacing was performed at cycle lengths of 250ms to 180 ms or to 2:1 block in the posterior RA (right atrium) and the posterior LA (left atrium). The primary endpoint was the sustained reproducible induction of sustained or non-sustained (> 5 seconds) AF. Procedural success was defined as freedom from PAF and antiarrhythmic medications at 3 month follow-up.

**Results:** Of the 47 patients, 23 (49%) had no inducible PAF and 27 (51%) had inducible PAF. Clinical characteristics were similar in both groups (Table). Freedom from PAF was 91% in patients without inducible AF versus 67% in patients with inducible AF. **Conclusion:** 1) Induction of AF with burst atrial pacing after successful PV isolation 1) is frequently observed; 2) is not related to anatomic or electrical remodeling as indexed by LA size and prior duration of AF; and 3) may be a marker for poorer PAF control after the procedure.

	No inducible PAF (n=23)	Inducible PAF (n=24)	P value
Age	49±16.6	50.2±17.2	ns
Prior AF>2 years	21(87%)	24(85%)	ns
EF	57.4±8.6	55.9±8.5	ns
Mean LA size	4.0±1.0	4.2±1.0	ns
Persistent AF	0	3	ns
No AF in Follow-up	22(91%)	16(67%)	p=0.09

1063-13

**Does the Clinical Presentation of Atrial Fibrillation Affect Long-Term Outcome After Catheter Ablation?**

Nicola Trevisi, Michela Casella, Antonio Dello Russo, Silvia Perlangeli, Stefania Riva, Giuseppe Maccabelli, Gaetano Fassini, Paolo Della Bella, Centro Cardiologico Monzino, Milan, Italy

**Background:** The pulmonary veins (PVs) have been demonstrated to be the major source of ectopic beats triggering atrial fibrillation (AF). Therefore, the electrical dissociation of PVs is deemed an effective approach to control AF. Controversy still exists about whether clinical presentation or the number of disconnected PVs could affect the long-term clinical outcome.

**Methods:** Ostial PV disconnection, assessed by entrance block, was performed in 158 patients (pts), 78% male, mean age  $57 \pm 10$  years, symptomatic for drug-refractory paroxysmal (pAF) (125/158, 79%) or persistent (33/158, 21%) AF. After the procedure, pAF pts were discharged without antiarrhythmic drugs if complete disconnection of all PVs was achieved; flecainide was given if persistent venoatrial conduction in one or more PVs could be demonstrated. Amiodarone was given to all pts with persistent AF. Pts were followed up by daily transtelephonic EKG during the first month and whenever symptoms occurred, thereafter by Holter recording and clinical evaluation at 1, 3, 6, 12 mos. In pts with stable sinus rhythm, anticoagulants were withdrawn at 2 months and antiarrhythmics were decreased and withdrawn at 4-6 months.

**Results:** Successful disconnection of all PVs was achieved in 128 (81%) pts; 82% (103/158) in pAF and 76% (25/158) in persistent AF pts (p ns). During follow-up (mean 24 weeks; range 1-56 weeks) the arrhythmia recurred in 45 pts. At 1.3, 6 months, cumulative AF free survival rate resulted higher in pts with successful all PVs isolation as compared to pts with persistent venoatrial conduction in one or more PVs (90%, 87%, 78% vs 52%, 31%, 20%, log rank 0.0001). Furthermore, cumulative arrhythmia free survival was higher in pAF than in persistent AF pts (84%, 75%, 66% vs 63%, 58%, 55%, log rank 0.048).

**Conclusion:** Following complete disconnection of PVs AF recurrence rate is significantly lower than after incomplete disconnection either in pAF or in persistent AF pts. Isolation of all PVs is effective in preventing paroxysmal AF recurrence, frequently in absence of antiarrhythmic therapy. The lower success rate in persistent AF pts suggests that mechanisms other than focal trigger may be related to arrhythmia perpetuation in this group.

1063-14

**Electrotonic Potentiation of Atrial Fibrillation Initiation From Pulmonary Vein Triggers: Insights Into Arrhythmia Mechanism**

Francis E. Marchlinski, Sanjay Dixit, Edward P. Gerstenfeld, David J. Callans, John F. Beshai, University of Pennsylvania, Philadelphia, PA

**Background:** The mechanisms underlying atrial fibrillation (AF) initiation in humans have not been adequately defined. Animal models of acetylcholine mediated AF show shortest refractory periods in left atrium (LA) and pulmonary vein (PV) region and microreentry has been suggested as a possible mechanism for AF initiation and maintenance in this model. **Methods:** To gain further insight into mechanism(s) of AF initiation in humans, we studied 46 pts undergoing PV isolation for paroxysmal AF. Using a quadripolar mapping catheter (CARTO-Biosense™) at each PV ostium (os), at 2 times threshold, premature extrastimuli (S2) during sinus rhythm with initial coupling interval (CI) of 400 msec with 10 msec decrements for subsequent CI were introduced till loss of local capture or failure to elicit repetitive firing. An additional decapolar circular mapping catheter (Lasso-Webster™) was also positioned in the PV initiating spontaneous atrial premature complexes (APCs). **Results:** In 5 of 46 pts undergoing the protocol reproducible initiation of repetitive PV firing with or without AF initiation was observed with programmed stimulation (PS) at CI of  $\leq 120$  msec (range 50-120 msec). Repetitive PV firing was reproducibly initiated in these 5 pts with stimulation only at os of PV that also initiated APCs (arrhythmogenic PV). Also, on Lasso catheter at os of arrhythmogenic PV, the poles demonstrating PV firing corresponded with poles that were earliest during spontaneous APCs and always preceded proximal ablation activation. Additionally, the atrial refractory period of all other PV ostium were >180 msec in these pts. **Conclusion:** Consistent initiation of repetitive PV firing by PS by extremely short coupled stimulation is exclusively observed in arrhythmogenic PV. Extremely short CI of S2 initiating PV firing argues against reentry and supports electrotonic potentiation of triggered activity and/or abnormal automaticity as the mechanism underlying the observed PV firing.